DRIVER

APRIL 1980

fill 'er upward

PROTECTING your PETROL PIGGYBANK

DRiVER

Protecting Your

Be conscious of how you drive. Remember that this thing is called a "*gas* pedal." Slow and easy does it; be very light on the pressure.

Or is this the real you—the "Incredible Hulk"? Heavy-footed and mean, *nothing* in moderation?

The 1960s were the time of plenty. The seventies were the time of warnings. And the eighties will be the time of acting on those warnings. What are we talking about? The supply of gasoline, of course. We've been warned that the supply is rapidly running out, and we have to do something to conserve what's left.

This may be "making the best of a bad situation," but it needn't be all that grim. Going on a "gasoline diet" isn't that unpleasant. Take a look at the suggestions in this article and we think you'll agree.

Here, we have given a fairly complete list of the driving ideas that will help you save gas. Look to this month's Backyard Mechanic for some maintenance (and related) tips.

One request: Don't tear this magazine up or hoard it. Pass it around to your friends and discuss the ideas you read here. You may have more ideas, and your friends may, too. Write us if you think of any, or if you think we're all wet on anything.

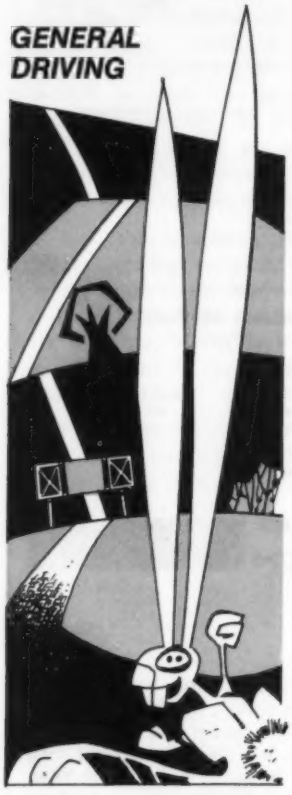
And one hint: You may find that the key to saving gas is to become *conscious* of how you drive. If you can become aware that "Hey! I've been wasting gas by doing such-and-such" you'll be, you'll pardon the expression, "miles ahead."

NOTE: This month's cover, and the other donkey photos, are the work of Elly Neeman, a young man attached to the Israeli Embassy in Washington, D.C. You might add this idea to your list. If you don't have a donkey, try your little red wagon.

77 (or maybe 79)
gas-saving suggestions

Petrol Piggybank

GENERAL DRIVING



□ Start out slowly. That means, no rubber-burning, gravel-spraying starts. "Jackrabbit" starts are kid stuff, and they're very wasteful.

□ Once you're going, get into high gear as soon as possible and do your accelerating in high. High is more economical than the lower gears.

□ Accelerate to a few miles per hour below the speed limit and then ease off the gas pedal. Your forward momentum will carry the car to the proper speed, and you won't have to use the brake to keep you from going over.

□ Drive at a steady speed. If you constantly press on the gas and then let up to slow down a bit, you're wasting fuel. (Also, you're not following the previous tip!)

□ Drive at a moderate speed. Your car will get its best mileage at between 30 and 40 mph. Try to travel within this range whenever possible.

□ Drive 55. Sure, 70 will get you there faster, but your car gets 21 percent better fuel economy at 55 than at 70. Besides, faster than 55 is illegal, remember?

□ Avoid unnecessary braking. If you have to brake, it often means you've been going too fast. If this sounds silly, read the next tip, because it's related to this one.

□ Anticipate the traffic ahead. If you see a slowing of the traffic ahead—for a stoplight or whatever—do you continue along at the speed limit and brake at the last minute? If so you're wasting gas. You know you'll have to slow and perhaps stop, so ease off the gas and let the car slow itself. Then brake as you near the other traffic. It's easier on the brakes, it's easier on the gas, and it's more relaxing.

□ Try to maintain your momentum. If you can keep moving, as in a traffic jam, do so. It takes less gas to move from even a few miles per hour than from a full stop.

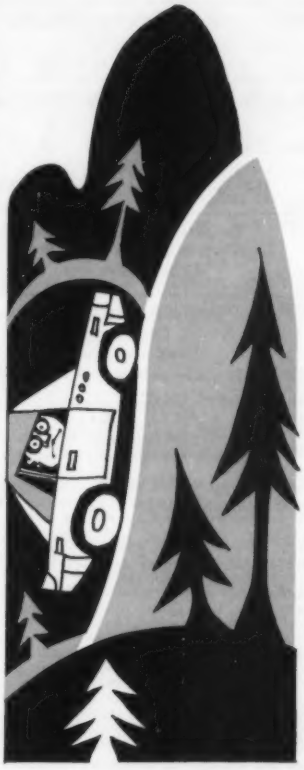
□ Don't tailgate. Following too close causes you to brake suddenly if the car ahead slows.

□ Like the sign says, "Keep back except to pass" and then only when you're ready to *make* the pass. If you're riding the guy's bumper and opposing traffic delays your pass, you'll have to brake and thus waste gas.

□ Avoid areas where you know you'll have to alter your steady speed, like hospital zones, school zones, and the like.

□ Likewise, avoid situations when you will encounter stop-and-start traffic, such as the rush hour traffic jam or downtown driving at noon. Stop-and-start driving is one of the most wasteful of practices.

□ Plan your route to your destination. Take the route with the fewest stop signs and lights, to avoid stops.



□ Avoid hills, if you can. When your car is going up hills, it gets its worst gas mileage outside of stop-and-start driving.

□ Avoid a lot of unnecessary turns. Frequent turns will increase the drag on the automobile, which costs mileage, in addition to the fuel used by braking and accelerating.

continued

DRIVER

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CONTENTS

Features	Page
Protecting Your Petrol Piggybank	1
Driver-Safety-ATA	7
Driving Positions	8
Motorcycle Cornering	14
Ali Boo Boo and the 40 Thieves	20
Danger Area	Back Cover
Departments	
Double Clutch	2
Double Tech	13
Timely Topics	19
The Backyard Mechanic	22
Backfire	28

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THE EDITOR SPEAKS DOUBLE CLUTCH

TIRED OF WAITING

"Why don't the car companies just stop making big cars and switch to little ones?" asks a secretary down the hall who is impatiently awaiting delivery of her new subcompact.

We showed her a press release from the Automotive Information Council that happened to be lying on our desk. Explains the Council: "Converting from one size of car production to another takes a complete revamping of assembly lines, the making of dies for body stampings, foundry changes for new engines and transmissions, and hundreds of other factors, involving thousands of suppliers. From blueprint stage to on-sale date for an all-new car takes several years and billions of dollars in capital investment."

"I can understand that," says the secretary, "but why couldn't the car companies have been prepared for the switch to small cars?"

That's a little harder to answer. They knew the switch was coming but they didn't think it would happen so fast. Small cars were virtually ignored in the showrooms until the spring of '79 when the gas lines in California started showing up on the TV news. Until that time the larger cars, vans and pick-ups had been the hot sellers. There were waiting lines for V-8s. March of 1979 was the 18th consecutive monthly record for Lincoln-Mercury, and Cadillac had completed record months on top of an all-time high calendar year. At the same time, small car dealers were advertising discounts and rebates.

Then came the temporary gas lines followed by jumps in gas prices.

continued on page 19

□ Similarly, avoid frequent lane changes. These increase the aerodynamic drag. Ditto for weaving *within* your lane.

□ Therefore, plan a route that is straight and level, if possible. (Obviously, you may have to make a trade-off between stops and hills. Do the best you can.)

□ If you do encounter a hill, get a "running start" at it. Do your accelerating at the bottom to attain the speed limit. As you near the crest of the hill, ease off the gas and let your momentum carry you over the top.

□ Also, shift to a lower gear when climbing steep hills. In this case a lower gear will be more economical because the strain on the engine will be too great in the higher gear.

□ As you go downhill, ease the pressure on the gas pedal. Let the force of gravity help you maintain speed.

Plan your route on any car trip, especially those trips with a lot of stops. This guy has the right idea, but he may be a little too literal in his translation of "planning."

DRAG

□ Drive with your windows closed when traveling on highways, and use the vents or the air conditioner. Driving at high speeds with the windows open creates gas-wasting drag, and it is actually more economical in this situation to use the air conditioner.

□ Another drag-producing problem is under-inflated tires. "Soft" tires will increase the car's resistance to rolling. Make sure your tires are inflated to the manufacturer's specifications.

□ Too much weight will also create drag. Don't carry any more in the car than is necessary. Distribute the weight evenly so that it's not all in the rear, thus raising the car's nose.

□ Use your brakes only to slow or stop. That is, don't drive with one foot on the brake pedal. This not only creates drag and wastes gas, it also wears down the brake pads. (And gives false signals to the guy behind you!)

□ Likewise, watch the emergency brake. If it is slightly worn, the car *will* run while it's on, but the engine will have to work harder to overcome the drag it creates.

□ Luggage racks on your car also cause drag. If you use them, put your luggage in a wedge shape with the larger bags to the back, to minimize this problem.

□ Slow down in heavy winds. Stiff headwinds or winds from the side will push your MPGs down, so don't fight them so much; you're better off driving slower. (Of course, a tailwind will *help* your mileage, and you won't have to press so hard on the accelerator.)

IDLING

□ Idling wastes gas. When you're idling, your miles-per-gallon equals zero. Don't idle the car more than is absolutely necessary. When the car is cold, 15 seconds of idling is usually sufficient. And the car warms better when it's moving; just drive slowly until it's warmed.

□ In cold weather, don't let the car idle for longer than 30 seconds.

□ When the car is warm, start it without touching the accelerator. Pumping the gas isn't necessary, and it's wasteful.

□ Don't gun the engine when the car isn't moving. Nobody is impressed by that—least of all your own wallet.

□ Also, don't gun it just before you shut it off.

□ When you stop, shut off the engine. Don't idle the car while you listen to the radio, or while you gather your belongings. Remember idling equals zero mpg.

□ If you'll be idling for longer than about 60 seconds, shut off the engine. This applies to "sitting in line for the bank drive-up windows" situations, not for traffic. It costs less gas to start a warm car than it does to idle for a minute.

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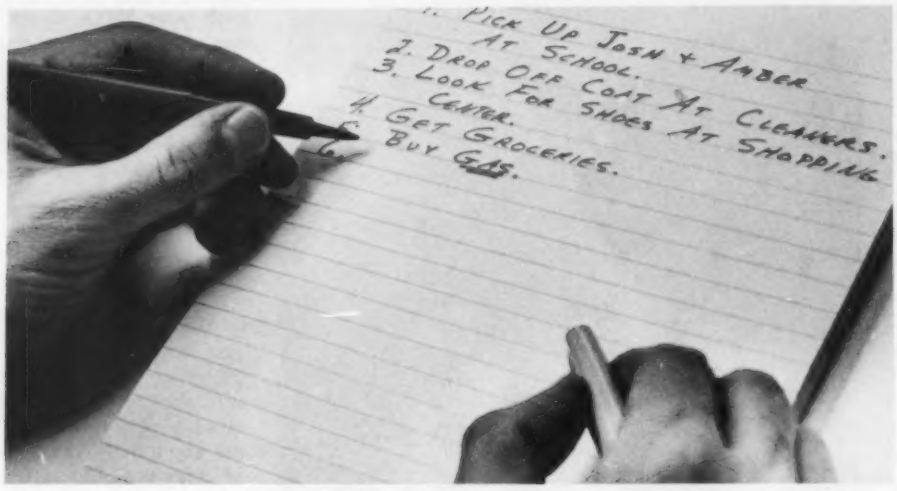


An itinerary is a nice thing. That way you know where you need to go and you don't waste time and gasoline—and you're less likely to forget something.

☐ At a stoplight, put your car's transmission in neutral. This eases the load on the engine and saves a little gas too.

PLANNING

☐ Plan your car trips. If you have errands to do, put them together and do them all at once. You'll be making short trips, but the car will be warm and will use less gas than when it's cold.

☐ On such short-hop trips, go to the farthest destination first. This will give the car the best chance of being warmed, and thus operating at peak fuel efficiency.

☐ Plan the trips so that you're driving a circuit and not backtracking or doing unnecessary driving.

☐ Get everything ready before starting the car. Fasten the seatbelts, get the packages and coats placed, etc.

MAINTENANCE, UPKEEP AND STUFF

☐ Remember the rolling resistance of tires. Radial tires roll more easily and thus save gasoline, so they are a gas-saver.

☐ The wider "performance" tires offer more rolling resistance. Narrower tires = less resistance = better mileage.

☐ Whatever tires you have, check their pressure at least once a week and air 'em up if they're low.

☐ Make sure your front wheels are properly aligned. If they're not, they'll increase drag and reduce mileage (and tread life!).

☐ Keep the car tuned up. (See this month's Backyard Mechanic!)

☐ Keep a log of your miles per gallon, so you can see when something goes wrong, like you've gone too long without a tuneup.

☐ Use gasoline of the proper octane rating. That means, don't use leaded gas in a car designed for unleaded, but it also means don't use a higher octane than you need. Use whatever octane rating doesn't give you knock in normal driving. (The octane rating of the gas will be listed on the pump. The suggested octane rating for your car will be listed in the owner's manual.)

☐ Don't overfill your tank. It might spill out on rapid acceleration, or when the temperature warms so that the gasoline expands within the tank. That's a *real* gas waster.

☐ When the pump shuts off, lift the hose to let the gas drain out into your tank.

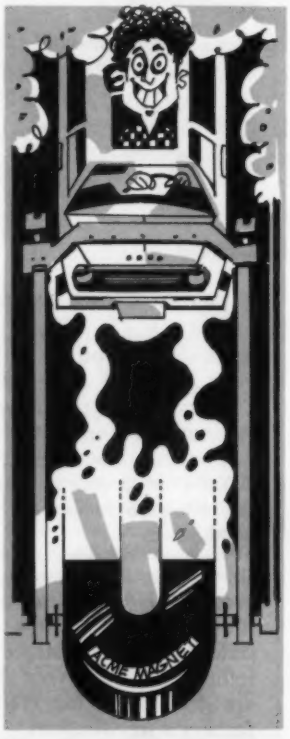
☐ Buy your gasoline when the air temperature is cool, not when it's hot. The gasoline will also be cooler and therefore not expanded in volume, and you'll get a little more for your money.

☐ Make sure the pump is set at "zero" before you start pumping your gas. No point in paying for someone else's gas *and* your own.

☐ You might install a vacuum gauge in the car. This device will tell you when your driving habits are wasting gas. (See the Backyard Mechanic in the January 1980 DRIVER.)

MISCELLANEOUS

☐ Forget all those so-called "miracle gas-saving devices" that you can buy to put on your car. They are a lot of baloney. (See "The Backward Mechanic," October 1979 DRIVER.)



□ Put a locking cap on your gas tank. This will save you gas by making it less likely someone will siphon the stuff out.

□ Don't use the accessories more than necessary, especially the defroster and the air conditioner. They use a tremendous amount of power.

□ Turn off the power accessories before you turn off the ignition. If you don't you run down the battery, which then has to be recharged by the alternator, which uses gasoline.

□ Don't use the accessories after the car is shut off, for the same reason.

□ When driving with an automatic transmission, ease up on the gas just before the car shifts.

□ Keep your foot off the clutch in a manual transmission unless you are in the process of shifting.

□ Keep your foot completely off the accelerator of the car when it is stopped.

□ When you're parking your car for the night, put it in such a position that you'll have little maneuvering to do in the morning to get going. A lot of backing and turning in a cold car is very wasteful of gas.

□ If you have a choice, always park where there is some shelter from the weather. This is not so much to protect the finish as to retain some of the car's heat. A warmer car starts easier.

□ Accelerate slowly on snow, ice, sand, or any unsure road surface. Spinning the wheels is worse than idling.

□ Clean all the ice and snow off your car in winter. Besides being better for good vision, this takes off all that excess weight that hurts your fuel economy.

□ In a parking lot, if you find a parking space, use it. Don't drive around at 5 mph looking for a closer one, and don't wait for someone to pull out of a closer parking space. This is a blatant gas-waster.

NEW CAR SHOPPING

□ When you're looking for a new car (or a used one) consider what the price of gas will be several months down the line. Get a smaller, more economical model.

continued

huh?

In going through the many sources we found for this article, we discovered these two tips. Take 'em for what they're worth. If anything.

■ Keep your gas tank on the full side, so you don't lose gas from condensation or evaporation.

■ Buy gas only when the gauge is at one-quarter or less. You won't risk spillage, and you get better mileage when the weight in the tank is down.

We've called the sixties a "time of plenty." They were also a time of cheap gas. A lot of you out there remember gasoline at 26 cents a gallon (or even cheaper). Although that was no longer ago than the 1960s, it seems kind of unreal today, doesn't it?

Will the seventies ever be looked on as the "good old days"? We doubt it. Prices were changing so rapidly (as they still are) that you won't be able to say "I remember when gasoline sold for a dollar a gallon," because it held that price for only a short time. Three days, if memory serves.

But we might be able to look back on the eighties as the time when we developed a little sanity on the subject of energy usage, and when we realized that we owed it to each other and to *ourselves* to conserve.

Every gallon of gas we don't use today, we can use tomorrow. Or the other way around: Every gallon we use today means one less we can use later.

Believe it.

continued

□ Don't waste money on accessories you don't really need. More power accessories mean more gas usage.

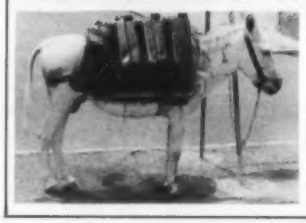
□ One accessory you *might* consider is a cruise control. This helps you drive at a steady rate, which as we've said is economical.

□ Also consider getting a car with overdrive, or with a five-speed transmission. These will also help.

□ If you live in a warm climate, get a lighter-colored car. A light-colored car will be cooler and you can reduce the use of the air conditioner.

ALTERNATIVES

□ Don't hop in your car to go only a short distance. Instead:
□ Walk.
□ Ride a bicycle.
□ Jog.
□ If you *must* have a motor vehicle, have you ever considered a motorcycle or a moped? Think about the 50 or 100 miles per gallon you could get.
□ For trips around town, try the bus.



No matter how you measure it, the national speed limit saves gasoline.

□ For going to and from work, join a car pool or a van pool.

smile when you say that

As gasoline prices continue to climb, people are going to need more and varied ways to vent their frustrations. Blowing off steam by blowing your horn (or worse, by acts of violence against the gas station attendant) will only cause you more trouble. So, we at DRIVER have modified the good ol' 10-code for use in the next gas crisis. Just shout the proper number out your window (or over the CB) and all the other *knowledgeable* people will get your message—and you'll get a load off your mind! (You'll notice we left a few off the list. You will have to imagine what they were—we'll never tell.)

10-1 $ _____ a gallon! You've gotta be kidding me! **10-3** Sure beats me where the gasoline goes. **10-7** This car really eats gas. **10-9** Beautiful! The gas costs more than the payments! **10-14** The heck with you! I get 40 mpg. **10-21** Isn't there a 75 mpg vehicle? **10-40** Another gasless holiday? **10-41** Are you odd? **10-42** Are you even? **10-44** They closed at noon. **10-45** They never opened. **10-46** I hate smiling gas station attendants. **10-53** Yes, sir; yes, sir; three gallons please. **10-55** Take a drive to a closed gas station, fella! **10-56** Here comes another price hike. **10-60** If you think I'm kidding, *you* try to get $5 worth. **10-80** If we have one more price raise this hour, I'll give up. **10-82** Is this any way to treat the American consumer? **10-90** Goodbye gas lines! I bought a bike! **10-91** Check the gas and give me a quart of oil.

55 MPH.

Driver.Safety.Ata

Stolen from Desiderata, with our apologies

Go 55 amid the noise and haste of the expressway and remember what safety there may be is in the seat belt. As far as possible without surrender, yield to all motorists. Seek your right-of-way quietly and clearly; and listen for the horns of others, even the small and ignorant; they too have rights-of-way.

Avoid loud and aggressive drivers, they are on their way to accidents. If you speed and compete with others, you may become fined and bitter; for always there will be faster and slower drivers than yourself, including the police. Enjoy your legal speed as well as your plans for gasoline tomorrow.

Keep interested in your own machine, however dull it may seem; it is a real possession in the changing times. Exercise caution in your maintenance, for the world is full of shady mechanics. But let this not blind you to those who have virtue; many mechanics strive for better performance; and everywhere there are mileage stretchers.

Be yourself. Especially, do not leave behind a possible car-pooler. Neither be cynical about the local gas station, for in the face of all adversity and disenchantment it is your source of fuel.

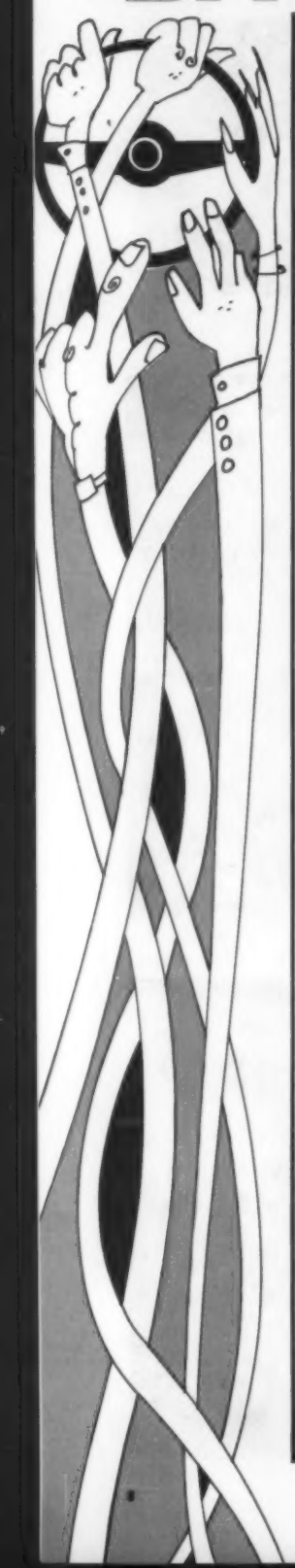
Take kindly the speed of the aged, gracefully surrendering your youth. Extend every ounce of fuel to shield us all from sudden shortages. But do not distress yourself with imaginings. Many fears are born at the first sign of a long line. Beyond a wholesome attempt to cut back trips, be gentle on the gas pedal.

You are a licensed driver, no less than the professional trucker and richman; you have a right to a gallon here. And whether or not it is clear to you, no doubt the energy crisis will continue to unfold as it should.

Therefore be at peace with the Government, the oil companies, and your fellow motorists, and whatever the cost per gallon (or liter), keep calm in the noisy confusion of life in the gas line.

With all its sham, dullness and broken limits, 55 is still a beautiful world. Without it, vehicles may not move at all someday. Be careful.

Driving Positions



We dedicate this section to all those out there who like to relax in their cars. Hey, you; wake up!! Yes, you—sitting on your backbone, lazily scanning the road as you cruise along. Now for the sermon: We believe there should be a balance between tension and comfort when you drive. You should be tense enough so that you're alert and paying attention to cars, signs, road conditions, etc., but comfortable enough so that you aren't distracted from the driving. Comfort is good, relaxation isn't. Relaxation is for plane trips, or on the bus, when your attention isn't required.

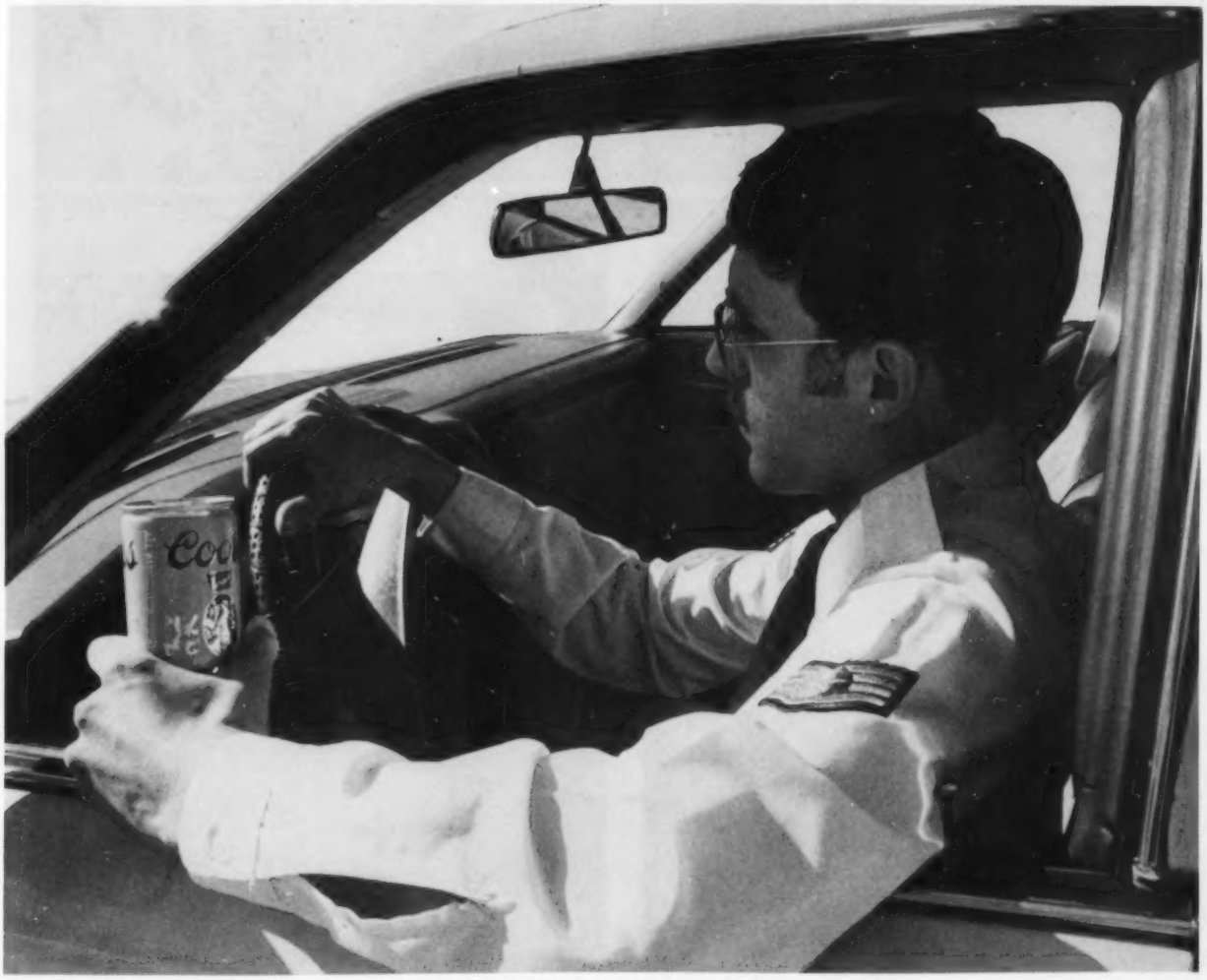
End of sermon.

Now look at these assorted positions and decide for yourself where you fit in. We hope you don't.

Let's hear it for all one-handed drivers: Boo! Hiss! Our tech sergeant here must think she's holding up the roof of the car. Or else she's just staying ready to make a hand signal? No, we don't think so either.

Another one-handed technique. Isn't this heart-warming? "Young love," we call it—a young airman off duty, and off in his own world where nothing exists except him and his girlfriend. He believes "getting there is half the fun." We disagree. Cuddling has its place, but not in the car.

How about this one? Relaxed, we'll grant you, but not right except for one situation. This is the proper hand position for use when you're backing up with a trailer hitched to the car. Believe us, she doesn't have one.



As if the other one-handers weren't bad enough, how about this idiot? No further comment.

continued

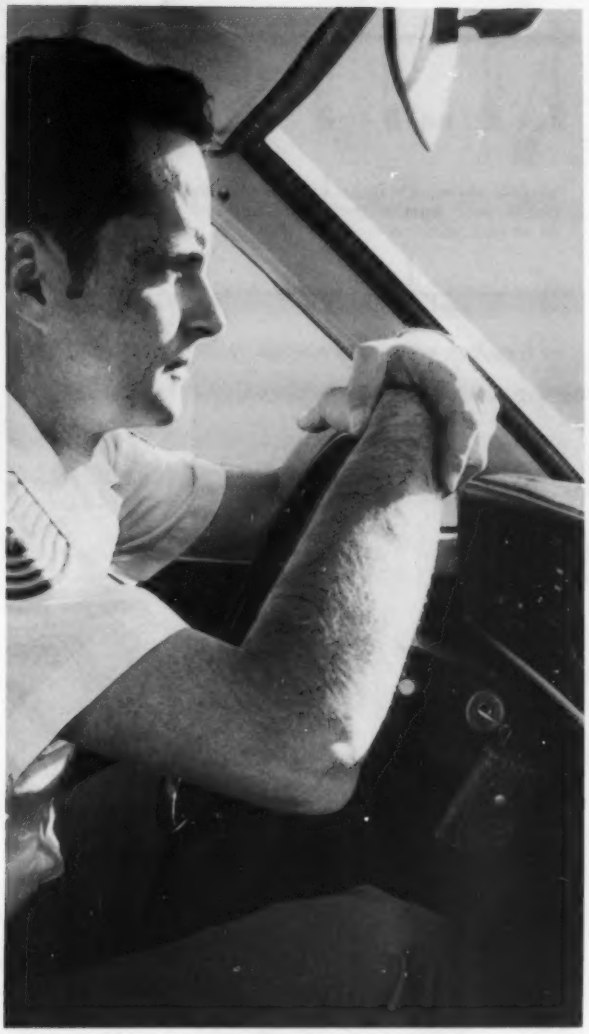
Okay, now to the two-handed drivers. A nice, relaxing way to lose control of the car in an emergency. Or maybe she's drying her nail polish.

You'll see this more often with a person who's been on the road a long time—the arms get tired. But some people just find this comfortable. We like 10 and 2 or 9 and 3 a lot better.

We never could figure out this one. If he needs to make a quick turn, just how is he going to do it?

Sitting too close to the wheel isn't really limited to the older folks, but you get the idea. This severely restricts his ability to move.

Her left foot may not be in the way, but she just looks a little too relaxed for safe driving. Feet on the floor, please. (At least she has two hands on the wheel.)

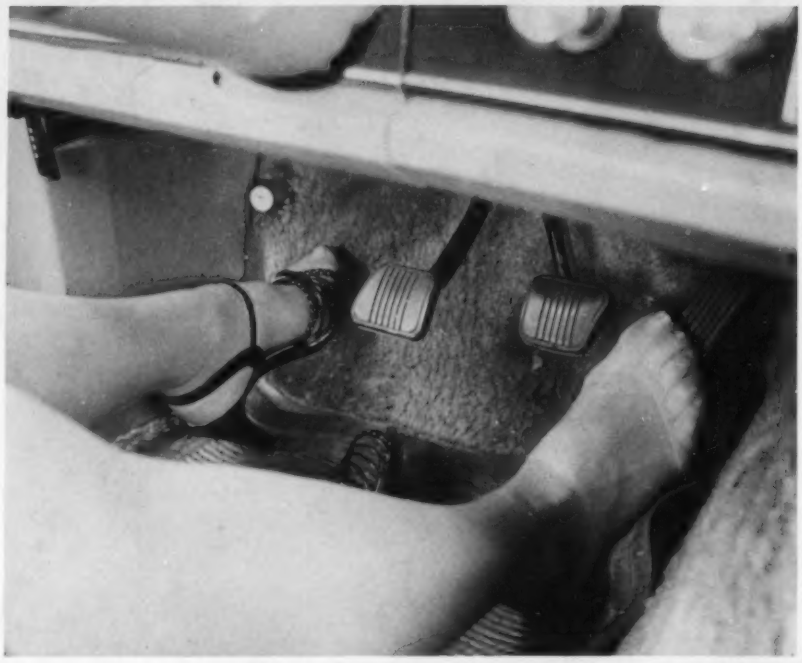


"I know I'll reach a town soon." This guy looks like a long-distance truck driver. He is another one without much room to move. He also risks getting a mouthful of steering wheel in a quick stop.

Where's the protection for these two? Mom can't wear a seatbelt because of the baby. If she did, the baby would be squashed with any sudden braking. Without it, both mother and baby hit the steering wheel and windshield. They'd be better off if she put the baby in an infant car seat, and if she wore her belt. Save the "front papoose" sling for out-of-car activities, please.

continued

Moving away from the driver, for a moment: How about the passengers? Yes, of course we staged this (in fact, we staged all of these). But the point is there are places a passenger shouldn't go. Even if she were *seated* in the boot for the convertible top, she would have no belt, and she'd be seated sideways. Other bad places for a passenger: Sitting in the back of a pickup. Sitting in the back of a van where no seats are provided. Or any position in a car with one's feet sticking out the window or in the driver's ear.

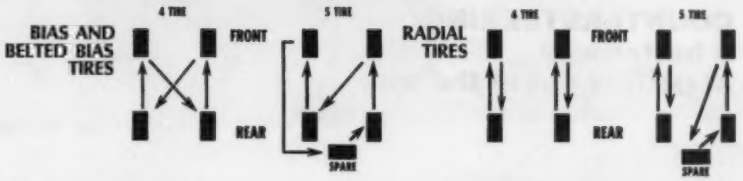


Relax! Take your shoes off! We're really *not* sold on bare feet (or stockinged ones) for driving. If she doesn't like to drive with the heels on, she should have a pair of sneakers in the car for driving. That way, there's much less chance of her feet slipping off the pedals.

One final example of one-handedness that isn't directly related to the others: Don't try to hold onto cargo like this. Borrow a friend's truck or go to a lumberyard that delivers.

tteecchh!!
DOUBLE TECH Q&A

By TSgt RON LATHROP



Tire rotation drill. Here are the patterns of auto tire rotation recommended by the Tire Industry Safety Council for safe, even wear and long mileage. Tires should be rotated every 6,000 to 8,000 miles, or sooner if irregular wear begins to develop.

I found one of your back issues (January 1979) on tires. When reading about tire rotations on pages 4 and 5, a question came to mind. Could you please tell me why serious tire damage occurs if tires are *not* rotated in the pattern shown on page 5? What happens if you have a flat on the left side of your car, must the spare be used only temporarily?

From the drawing you sent along, your question seems to mainly concern the five-tire rotation of radials. Here's what happens and why. Except for when the tread actually touches the ground it is traveling at zero miles per hour—it's just following the wheel around for the ride. However, at that point where the rubber comes in contact with the ground it must accelerate from zero to whatever speed the tire is traveling instantaneously. If you're driving at 50 mph, this instantaneous acceleration is equal to 100 mph on the leading edge of the tread. With bias-ply tires, the ply absorbs part of this shock as they are set at an angle to this tread-ground impact. On the other hand, radial belts follow this impact. (This is one of the reasons radials offer less rolling resistance and deliver better gasoline mileage.) This harsh impact with the ground sets a pattern into the tread based on its direction of rotation. Thus passenger-side tires turning clockwise have a different pattern than driver-side tires turning counterclockwise. (Or, for those of you with right-hand drive vehicle: driver-side, clockwise; passenger-side, anti-clockwise—said with a strong cockney dialect.)

Now, if you take a radial that has run several thousand miles on the passenger's side of the vehicle and mount it on the driver's side, it will be turning backwards to the pattern already ingrained in the rubber. This will cause a serious cupping problem in the tread. At best, the end result will be a tire that wore out long before its time. And leading up to that early wear-out there will be all kinds of tire vibration problems that balancing and alignment will not correct. The tread could even chunk or separate.

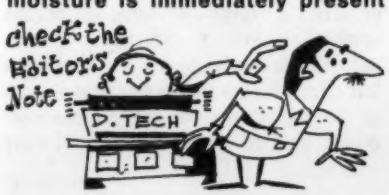
Yes, you are correct when saying that the spare should be used on the left only temporarily.

Before rotating your radials, always consult both the vehicle and tire manufacturer. They usually have the latest tips. For example, most manufacturers advise against rotating tires on front-wheel-drive vehicles (see Timely Topics, January 1980 DRIVER). Because there is little load on the rear tires, they simply don't wear much. Thus, when purchasing new tires, only two will be needed and they should be put on the front.

Take a look at the four-tire rotation for a second. If you use this pattern, when it comes time to buy new tires and you are buying the same brand as well as tread that are already on the vehicle, you'll need to pay for only three tires. The unused spare will be your fourth "new" tire while the best of the remaining four casings becomes the spare.

As you can see, the world of tires is constantly turning.

I have a 1954 Willys M38A1 military surplus Jeep. The problem is that I am getting water blown up the oil filter tube into the valve cover vent and carburetor intake hoses. This moisture is not from condensation in the crankcase as I have removed and cleaned the oil pan, changed the oil and filter, and replaced the head gasket, ensuring the bolts were all properly torqued. Compression and vacuum checks appear good. Fresh moisture is immediately present when again starting the engine. I removed the oil filter pipe and ran the engine. It appears as if the water seeps in around the edge of this opening in the block just above the crankcase. The higher the rpm, the greater the amount of seepage. Can you diagnose this problem and provide a remedy?



I am sorry, but if you'll turn your attention to the editor's note below you'll see that she says we handle only questions of a general nature that might be of interest to a majority of our readers. What you need is a mechanic who has spent most of his life inside an engine compartment instead of at a typewriter. Perhaps the best known of these type mechanics is Smokey Yunick. His column, "Say, Smokey—," is a monthly feature in *Popular Science*. You can write to him at: "Say, Smokey—," *Popular Science*, 380 Madison Ave., New York, NY 10017. In the meantime, retorque everything after 1,500 miles, put some sealant around the oil filter pipe and try not to think about a cracked block.

Editor's note: Double Tech is a question and answer column in which DRIVER will attempt to make clear some of the cloudy subjects in readers' minds. Unlike other automotive magazine Q&A columns, Double Tech doesn't deal with specific questions such as, "Why is my Wink-Snoozymobile hard to start on rainy mornings?" Instead Double Tech fields questions that are of general interest to the majority of our readers. However, when sending questions to Double Tech be sure to include all available information because this will help in finding the correct solution. If you have a question you'd like an answer to, and you feel others could use the knowledge also, send it to:

Double Tech
DRIVER Magazine
HQ AFISC/SEDD
Norton AFB, CA 92409

As with most magazines, DRIVER has a long lead time between writing and publication, so don't be surprised if it takes several months to get a reply.

COUNTERSTEERING:
A better way
of getting out of the way

TECHNICAL AND APPLIED SCIENCE

motorcycle co

by YN2 RICHARD L. OWENS
Motorcycle Safety Foundation chief instructor
USS Mount Whitney

Every motorcycle rider at one time or another must avoid an obstacle at a speed greater than 15 mph. The obstacle may be a muffler, a pothole or another vehicle. Regardless, it must be avoided.

For reasons of collision avoidance and precision maneuvering, a technique used effectively by up-to-date riders is now taught by the Motorcycle Safety Foundation. It is called countersteering. It is simply the best available technique for getting out of the way of an obstacle in the fastest time and shortest distance. With understanding and practice it can be used by novice and expert riders alike.

EDITOR'S NOTE: Countersteering works; however, it does require understanding and practice. Several years' experience is recommended before attempting this maneuver without trained supervision. Therefore, DRIVER recommends that you seek out and consult a rider experienced in countersteering to assist in understanding and practicing this technique. Better yet, ask your local Motorcycle Safety Foundation instructor to teach you the fundamentals of safe motorcycling.

Countersteering is no different from other skills. It requires the rider to first practice at relatively low speeds, but it does not limit its practical application to any speed—however great that speed may be.

If you watch road racers you'll see them negotiate high speed turns without body movement in relationship to the motorcycle. Yet a novice riding the same terrain and the same turns will look erratic, sloppy and basically uncoordinated. Why? How do the experts do it so smoothly? Basically, the novice rider is moving around on the bike trying to change the vehicle's center of gravity and force it to lean and turn with body movement. The result is a less accurate path through the turn than that of the rider predicting the invisible line using the countersteering principle.

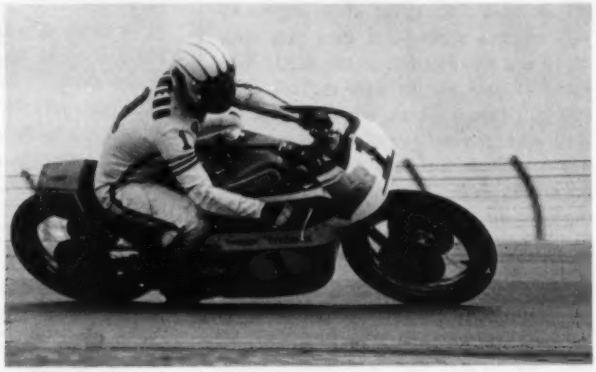
What happens to a motorcycle during countersteering? As the rider approaches a right-hand turn, he or she applies pressure to the right handlebar. Momentarily the front wheel goes left which forces the motorcycle to lean to the right—into the turn. Done correctly, a third of the turn has already

continued

After low speed practice, countersteering can m
at one time or another—or another—or. . . .

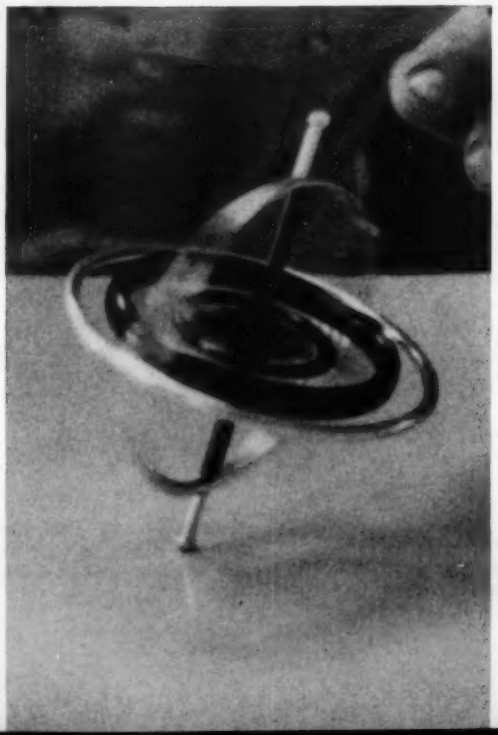
Sometimes obstacles pop up leaving the motorcycle rider little maneuvering room. Finding out that shifting body weight won't lean the machine at this point is far too late. If you disagree, ride a mediumweight or heavy motorcycle with the throttle tensioner screwed all the way down. Then take your hands off the bars and see how far you have to lean your body to make the bike lean over. With understanding and practice countersteering is the answer to the problem.

orne ring



Motorcycle road racers negotiate high speed turns without body movement. How? With countersteering, that's how.

can make you a better rider. It may also save your skin



If you find grasping the technical explanation of countersteering difficult, buy a gyroscope at your local toy store (they are less than $5) and study its actions and reactions. Look closely; this is as close as you'll ever see to a road test or product evaluation in DRIVER.

been accomplished. As pressure on the right handlebar is let up, the front wheel positions itself in line with the bike. However, since the machine is already leaning into the turn, it will stay at that angle of lean and continue around the turn in proportion to the lean and speed.

Now that you know a little about the basics, you'll want to know how to apply them. Suppose you are traveling down a side street at 30 mph. As you enter a right-hand turn you suddenly see an oil slick in the road. You know if you go through the oil slick you will lose traction, but that same oil spill will prevent you from going into a lean without sliding out to the left into oncoming traffic. So you must countersteer. You put pressure on the right handlebar, you actually almost hit the handlebar. Presto, you go to the inside of the right turn, precisely maneuvering around the oil slick.

The important thing to remember is you can do this fast, but *first practice it at low speeds to gain the confidence in yourself and your machine.*

"At first I was skeptical and had to try it for myself," said one rider with several years' experience. "It works great."

Another long-time motorcycle rider said, "If you had told me about it yesterday, I would have called you a liar. Now I realize—and I've been riding 15 years—that I do it all the time, but now I do it with understanding and can precisely pick my track."

You too can be a better rider using countersteering, but first practice it at low speeds. It may save your skin at one time or another—or another—or. . . .

WARNING: Do NOT attempt countersteering without first practicing the technique at low speeds with supervision.

everything

RESISTS CHANGE

THE TECHNICAL SIDE OF COUNTERSTEERING

For those of you who began yelling, "Hold it right there," when Yeoman Owens wrote, "Momentarily the front wheel goes left which forces the motorcycle to lean to the right—into the turn," I'll now attempt to explain why this happens without getting too technical—I hope.

Fig A
A typical motorcycle tire and wheel. Note the curve of the tread design because this is what helps the bike turn when in a lean.

Basically what is happening is a gyroscopic action. This involves two simple physics laws. The first is that anything that is moving wants to keep moving, and anything that is at rest wants to stay stopped. The second law is that anything that is moving in a certain direction wants to keep moving in that particular direction.

Do you remember playing with a top as a child? As you recall that fun, simple, little toy seemed like it was

going to go on spinning forever once you got it going (the first law) although friction with the air and surface it was on eventually ground it to a stop. You will also recall that the top would stand upright by itself as long as it was spinning relatively fast (second law). If you were adventurous (or just mis-

continued

Fig B
Motorcycle tire cross-sections generally resemble this when the bike is upright. All distances from the hub centerline to the tread are the same.

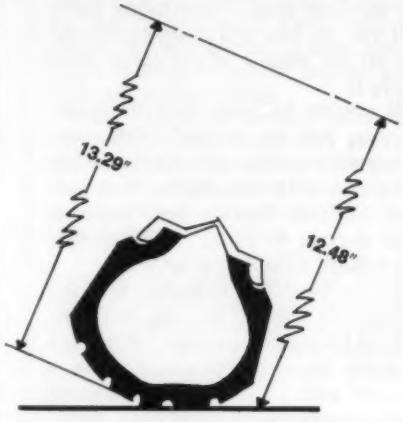


Fig C
When leaning, the motorcycle tire cross-section has a different contact surface with the road. This contact patch has many different radii from the largest on the left to the smallest on the right.

In one complete revolution the inside of the tire covers 78.41 inches . . .

. . . during the same revolution the outside of the tire must travel 83.50 inches, or 5.09 inches further.

Fig D
The different radii mean that certain parts of the tire must cover more ground in a single complete revolution of the wheel than other parts of the tread. As you can see, this is impossible in a straight line.

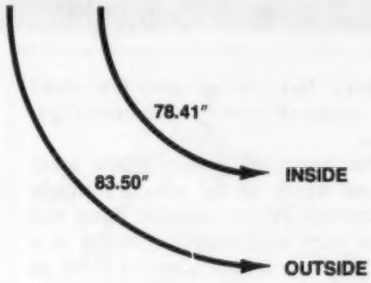


Fig E
However, if the wheel (and the bike) follow a curving path, a portion of the tire can and must cover more ground than other portions of the tread.

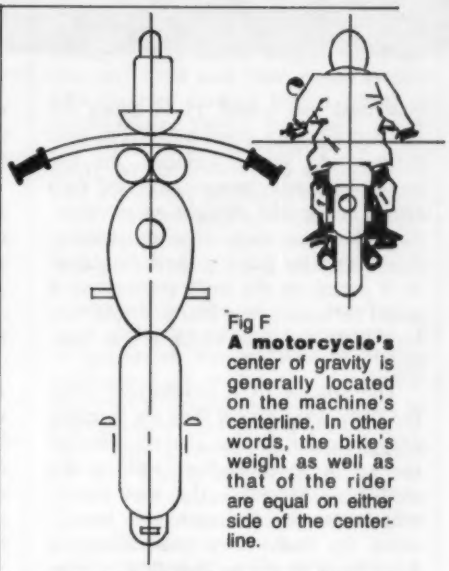


Fig F
A motorcycle's center of gravity is generally located on the machine's centerline. In other words, the bike's weight as well as that of the rider are equal on either side of the centerline.

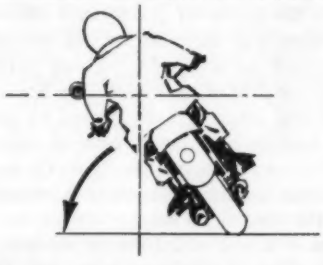


Fig G
Leaning a motorcycle shifts the center of gravity into the lean angle. Without regard to forward motion, gravity wants to pull the machine down.

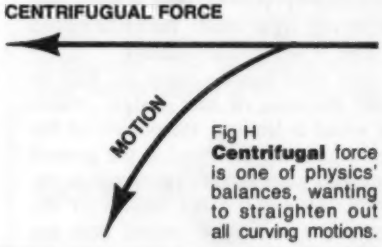


Fig H
Centrifugal force is one of physics' balances, wanting to straighten out all curving motions.

Fig I
A balancing act results between gravity and centrifugal force on a leaning motorcycle. If gravity is greater (i) the bike falls, while should centrifugal force exceed gravity (ii) the bike straightens up. Both gravity and centrifugal force can be increased or decreased by changing the bike's speed, lean angle or turning radius.

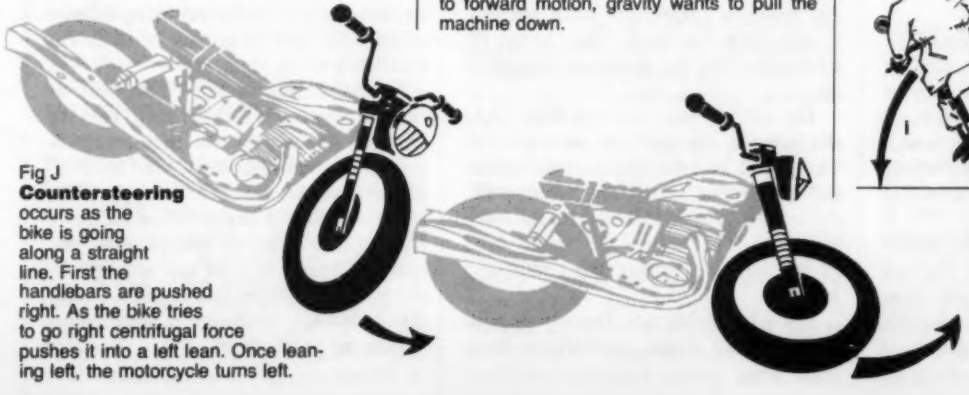
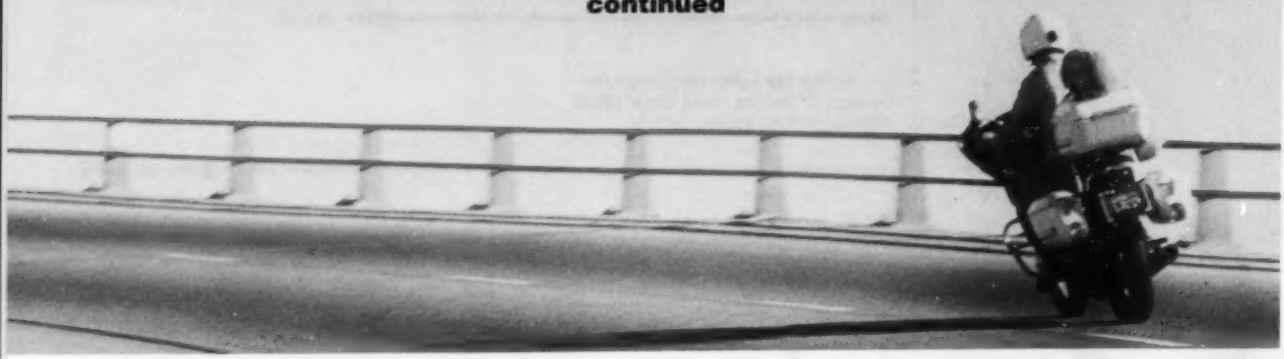


Fig J
Countersteering occurs as the bike is going along a straight line. First the handlebars are pushed right. As the bike tries to go right centrifugal force pushes it into a left lean. Once leaning left, the motorcycle turns left.



chievous) you would try to knock the top down with a quick push from your fingers. As you remember, the top would lean over momentarily and then return to its old straight-up position. Now the more inquisitive top spinners found that by placing their fingernail or a pencil on the top's top center, it could be leaned over and it would then stay at the angle to which it was leaning.

The wheels of a motorcycle work the same way, except they are spinning perpendicular to the ground whereas the top is spinning horizontal to the surface. Likewise, the motorcycle wheels want to continue to spin straight down the road. They resist efforts to force them to change direction or lean. Momentarily pushed into a lean, the wheel will right itself. Yet once forced to lean, it will remain leaning.

Why does leaning cause the bike to turn? Because of tire design. When the wheel is leaning, the outside of the area where the tire touches the ground is running on a larger diameter than the inside. As a result the outside of the tire must cover more ground than the inside each time the tire does a complete revolution. The only way this can happen is if the bike turns. See figures A, B, C, D and E.

So far we've seen that a moving bike wants to continue along in a straight line and upright. If we lean it over momentarily, it will straighten up again. If we force it to lean, it will remain leaning. And once the wheel leans, the bike turns in the direction of the lean.

A quick review of the mumbo-jumbo terms so far would have to include inertia (the tendency to continue moving or stay stopped) and gyroscopic (retaining the axis of the plane of motion). But now we must talk about the center of gravity and centrifugal force.

The center of gravity is the point around which all the vehicle's weight is centered. This is another thing that helps keep a motorcycle running in a straight line. If you were to draw an imaginary line from the center of the front wheel to the center of the rear wheel while looking straight down on a motorcycle, the center of gravity would probably be somewhere on that line. (See figure F) What this boils down to is that gravity is pulling on each side of the bike evenly, therefore the bike (when moving) doesn't want to fall over.

If you tilt the machine to one side now, the center of gravity will shift— the weight of the machine will be concentrated on that side. At this point, with one side of the motorcycle heavier than the other, gravity wants to pull the heavier side down without regard for forward motion. (See figure G) And the bike would fall over if it weren't for the centrifugal force.

As you will recall, when we lean a bike over it starts to turn, but the physics laws don't like going in circles, preferring straight lines instead. The end result is centrifugal force pushing to straighten the circle. (See figure H) Remember the top wants to straighten up.

The further you lean the bike over, the greater the pull of gravity. The further you lean the bike over the tighter the circle becomes, The tighter the circle, the greater the centrifugal force becomes. The higher the speed used in the turn the greater the centrifugal force.

It's a balancing act. Gravity is pulling the bike down, centrifugal force is trying to straighten it up. If you lean the machine too far over at too low a speed or in too shallow a corner, gravity wins and you fall over. On the other hand, if you are going too fast for the lean angle, centrifugal force will win, the bike will straighten up and run off the outside of the curve. (See figure I)

If you've followed everything until now, you are probably still wondering why turning the handlebar left makes the bike turn right. Well prepare yourself, because here comes a final attempt to bring it all together and explain countersteering.

As the handlebar is pushed left, the motorcycle tries to go left, but centrifugal force pushes it into a right lean to make the machine continue on a straight path. With the bike leaning right, it of course must turn right. The longer the rider keeps the handlebar turned left the lower the lean angle will become. Allowing the bar to return to a centered position will hold the bike at whatever lean angle it has reached, assuming that the speed is enough to counter the pull of gravity with centrifugal force. (See figure J) To return the motorcycle to an upright and straight path the rider either opens the throttle so that the centrifugal force exceeds the pull of gravity or turns the handlebar to the right.

So that brings us full circle back to the beginning. Everything resists change. As long as the motorcycle is going in a straight line, the laws of physics are fat, dumb and happy (Editor's note: Sort of like technical editors.) But once you try to change that, the machine blows its cool and attempts to get back to straight-line motion. Using this resistance to change is what countersteering is all about.

Timely Topics

RUST FIGHT BEING WON

The war against auto rust is being won, says the Automotive Information Council (AIC). It has been a long uphill battle because every time a new rust-fighting process came along it was countered by an increased use of road salt.

Now, however, the auto makers have made such progress that they can offer three-year warranties that protect the new-car buyer for as long as he keeps the car. One rust proofer's policy can be transferred if the car is sold within three years.

To make possible the longer warranties, the car makers have increased the use of galvanized steel, zinc-iron alloy, zinc-rich primer, plastic fender liners, aluminum panels, waxes, sealants and tougher paints.

While designing the new cars, they improved drainage from body cavities, eliminating moisture-holding pockets. These moves are most important because perforation rust usually comes from the inside chambers.

AIC notes that in developing new coatings and processes, the makers first subject prototype body components to high humidity and salt sprays in special cabinets after pelting the parts with gravel to measure the effects of stone damage.

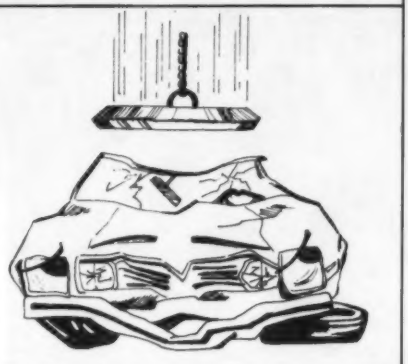
Test vehicles are run through torturous tests that produce years of corrosion exposure in a matter of weeks, using sequences through salt troughs, spray mists, mud, over gravel roads, inside heat-humidity and freeze rooms and finally sitting outside.

In the all-out battle on rust, the Automotive Information Council cautions that the owner still has a responsibility.

How much the car is driven, especially during bad weather, how often the car is washed and waxed all play a role. Additionally, the owner is advised to periodically clean out the drain holes at the bottom of the car doors to release any build-up of moisture.

PROTOTYPE DISPOSAL

Each year car makers purposely destroy cars costing hundreds of thousands of dollars rather than allow them on the street, according to *Automotive News*. The cars are prototype vehicles used in damaging road tests. Many of the cars appear to be in perfect condition at the time they are destroyed. General Motors sends a representative to accompany the cars to the scrap dealer and witness the crushing. Ford requires scrap dealers to sign an agreement that any part that survives crushing will not be sold or given away. Chrysler performs "autopsies" on the cars following tests and often cuts them in half. Volkswagen donates prototypes to vocational schools with the stipulation that they are not to be driven or titled but only examined. Prototypes that have undergone milder tests, such as for braking, acceleration, and fuel economy, are sometimes repaired and sold to employees or used on company grounds as interbuilding "taxis." *(Traffic Safety)*



NHTSA DEFENDS RULES

The National Highway Traffic Safety Administration has published a new report on "The Contributions of Automobile Regulation" which concludes that its safety and fuel economy standards are justified and have helped, not adversely affected, the auto industry. Prepared by the agency's Office of Plans and Programs, the report addresses criticisms of NHTSA's programs.

NHTSA estimates that safety features contained in 1978 model year automobiles cost $300, about one-half the amount claimed by some auto makers. These features, says NHTSA, constitute less than five percent of total vehicle price. Both safety standards and fuel economy regulations challenge the industry's technological potential and promote competition by requiring compliance with performance standards.

"The agency's safety regulations have been a major factor in the decline of the fatality rate over the last decade," according to NHTSA. Estimates based on General Accounting Office procedures indicate that safety standards have saved more than 55,000 lives through 1978, "a number which is increasing by nearly 10,000 per year as newer, safer vehicles replace older, less safe ones." The report points to the increasing number of safety defect recalls as illustrations of the failure of the industry to provide maximum safety and the need for federal presence in this area.

DOT TO INVESTIGATE VW DIESEL "RUNAWAY"

The U.S. Department of Transportation (NHTSA) has opened an investigation of Volkswagen diesel-powered automobiles that are suspected of being subject to uncontrolled acceleration.

NHTSA warned owners of 1977 through 1980 diesel engine VW Rabbits and 1979 and 1980 diesel engine VW Dasher models that a possible safety-related defect may exist, causing the driver to experience runaway acceleration. The agency said that more than 98,000 of 1977 through 1979 vehicles may be affected by the investigation. It does not know the number of early 1980 models which may be involved.

Preliminary data on the diesel-powered VWs disclose the presence of an excessive accumulation of engine lubricating oil in the air filter housing that provides an oversupply of combustible fuel in the intake system. This provides an unexpected auxiliary source of fuel for the engine, which can cause increased engine speed or continued operation after the ignition key is turned off.

All owners of VWs who are experiencing problems either with engine runaway or accelerator system malfunctions are asked to report such instances. The agency's toll-free Auto Safety Hotline is 800-424-9393.

DOUBLE CLUTCH

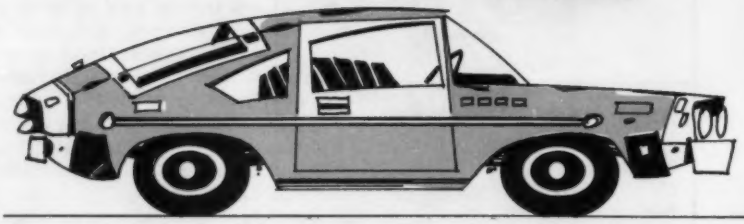
continued from page 2

Almost overnight the hot sellers became the dust-collectors, and vice versa.

The import makers were able to flood the market with small cars because most of them had never built anything else in the first place. Their roads and streets plus the high cost of their fuel never allowed any sizeable market for large cars to develop in their own countries.

And so imports accounted for an all-time high of one in five new-car sales in 1979. But the American companies are bound to catch up with the public's new ideas soon.

Ali



BOO BOO 1

Ali Boo Boo leaves her unlocked car on a dimly lighted street.

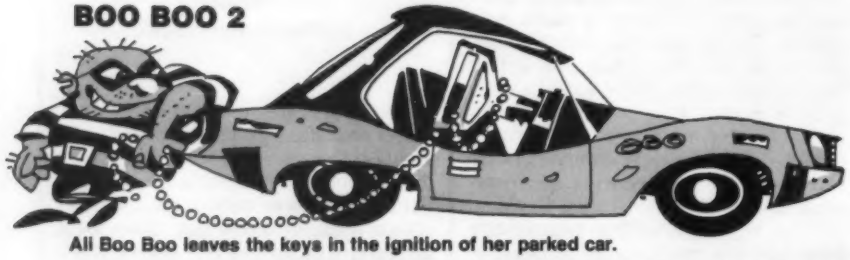
Comment by thief No. 1 speaking for himself and thieves No. 5, 7, 9, 11, 34 and 6:

"Show me an unlocked car on a dimly lighted street and I'll show you a dimly lighted street with an empty parking space."

Additional comment by thief No. 15:

"Show me a locked car on a well lighted street and I'll show you a car thief walking fast to find an unlocked car on a dimly lighted street."

BOO BOO 2



Ali Boo Boo leaves the keys in the ignition of her parked car.

Comment by thief No. 20, speaking for himself and thieves No. 2, 32 and 36;

"Show me a motorist who leaves the keys in the ignition and I'll show you a motorist who might as well have left the pink slip in the glove compartment."

Additional comment by thief No. 30:

"Hey 20, Several of my marks *DID* leave the pink slip in the glove compartment and a couple left their credit cards as well."

BOO BOO 3

Ali Boo Boo leaves her car at a public parking lot.

Comment by thief No. 27, speaking for himself and thieves No. 38, 39, 13, 18 and 3:

"Show me a motorist who uses a public parking lot where she must leave the keys with the car and I'll show you a motorist who'd better hope the parking lot attendant isn't crooked."

Additional comment by thief No. 17:

"Show me a motorist who leaves her keys with a crooked parking lot attendant and I'll show you a motorist who could lose everything in the trunk of her car but the kitchen sink."

Additional comment by thief No. 4:

"Show me a crooked parking lot attendant with the opportunity to make duplicates of his customer's keys, including her office and house keys, and who can learn her address through her license plates, and I'll show you a crooked parking lot attendant who can boost that kitchen sink."

Additional comment by thief No. 11:

"Show me a motorist who doesn't make a visual check of her car's tires when she claims her car from the parking lot and I'll show you a motorist who may have suffered the old switcheroo . . . four old tires for the ones she had when she drove onto the lot."

Comment by Ali Boo Boo:

"But how can I tell if a parking lot is honest or dishonest?"

Thief No. 10:

"You can't. So what you do is you leave your ignition key only with the attendant and don't tell him how long you're going to be gone. When you get back, check your car . . . the battery as well as the tires. Better yet, find a parking lot where you can lock your car and take the keys with you."

Boo Boo and the 40 Thieves

BOO BOO 4

Vacationing Ali Boo Boo stops to eat at a restaurant along an Interstate Highway.

Comment by thief No. 14, speaking for himself and thieves No. 21, 22, 28, 29, 31 and 33:

"Show me a car loaded with luggage pull into a restaurant parking lot and I'll show you a car that can be unloaded before the owner has sprinkled the croutons on her clam chowder."

Additional comment by thief No. 12:

"Show me a car loaded with luggage pull into a restaurant parking lot and I'll show you a car thief who knows he's got at least half an hour to boost that luggage."

Comment by Ali Boo Boo:

"What do I do? What do I do?

Thief No. 24:

"Your best protection is to park in the busy, lighted area of the parking lot. Only a dummy would try to boost a car under those conditions, which is why I'm in the slammer."

BOO BOO 5

Ali Boo Boo doesn't know her license plate number.

Thief No. 23, speaking for himself and thieves No. 25, 26, 35 and 37:

"Show me a motorist who never checks her license plates and I'll show you a motorist who doesn't know her plates were boosted by Bonnie and Clyde and are on their getaway car."

Additional comment by thief No. 8:

"Show me a motorist who doesn't know that her plates were boosted and I'll show you a motorist who doesn't know that Bonnie and Clyde replaced her plates with another stolen set."

Additional comment by thief No. 19:

"Show me a motorist whose boosted plates are connected with a crime and I'll show you a motorist trying to explain *that* one to the cops as well as the false plates she does have on her car."

Additional comment by thief No. 16:

"It's a hard, hard world, Ali Boo Boo."

BOO BOO 6

Ali Boo Boo thinks the police will arrest the thief and recover her automobile if it is ever stolen.

Thief No. 40:

"Show me a mark who thinks she'll get her stolen wheels back and I'll show you a mark who stands a fifty-fifty chance of walking her feet off down to the knees before that ever happens."

Additional comment by all 40 thieves:

tuning for mileage

All the driving tips found earlier in this issue aren't going to do you as much good improving gasoline mileage as a tuneup.

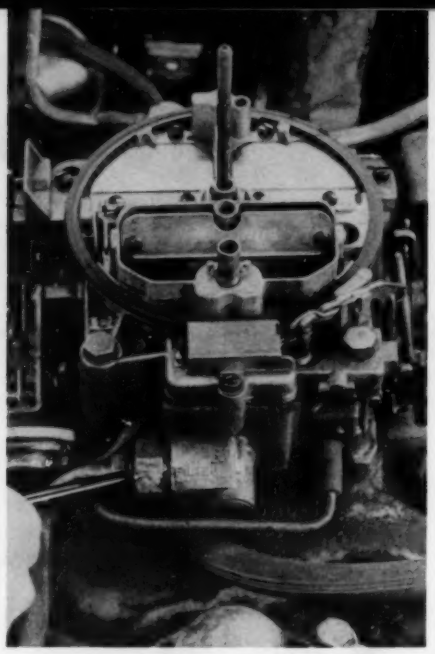
But first, let's put to rest any rumors you've heard about super-trick ways of tuning a car to double the gas mileage: they ain't so. There just are no magic tricks or gadgets that will substantially increase fuel economy. The truth is, your car operates at its best when it is tuned properly to specifications. Thus the best way to maximize gas mileage and *performance* is to perform a thorough tuneup.

Now don't keep the *truth* to yourself. A recent study by Champion Spark Plug Company showed that about 42 percent of all the vehicles in the United States "show evidence of improper engine maintenance and are, therefore, wasting fuel." That 42 percent represents about 45 million vehicles wasting 3.2 billion gallons of gasoline annually!

The average tuneup produces an 11.7 percent improvement in fuel economy. There are vehicles that have seen 50 percent improvements as the result of such maintenance.

Let's put this into your gas tank and out of your pocketbook. During 1978, the average vehicle in this country traveled 11,824.46 miles, recorded 14.06 miles per gallon and thus used 841 gallons of gasoline. The 11.7 percent fuel economy improvement from a tuneup would have increased the mpg to 15.71* and cut the number of gallons to 752.9*. The 88.09 gallons* saved at prices approaching $1.50 per gallon represent a $132.14* annual savings. Put that in your gas tank and drive on it!

*Figures stated are rounded; however, calculations were carried out eight decimal places. Therefore, using the figures displayed will not necessarily produce the exact answers shown.



Gasoline filters on GM vehicles are usually inside the carburetor. When removing the line note how the filter and spring insert in the filter housing so you can install the new filter correctly.

Of course, you don't gain anything by tuning an engine that doesn't need it. Signs that a tuneup is necessary include a drop in mpg, rough idling, hesitation, dieseling, hard starting, stalling, surging, pinging, misfire and lack of power.

If you're going to have somebody else tune your vehicle, check out the October 1979 DRIVER first. Even if you're going to do it yourself, give that issue's Backyard Mechanic a once-over. The bottom line of the October article is: find a reputable mechanic and/or parts store sales representative.

As the Backyard Mechanic is only a general guide to maintenance topics, a manual should be consulted when performing any maintenance. Procedures do vary from vehicle to vehicle. And as long as we're talking about the manual, read the section on tuneups completely before beginning. You'll not only get a good idea about what's involved, as well as what parts and tools will be required, but you also may find a very helpful hint buried in the fine print. Sometimes there's even a hint about step 7 in step 34.

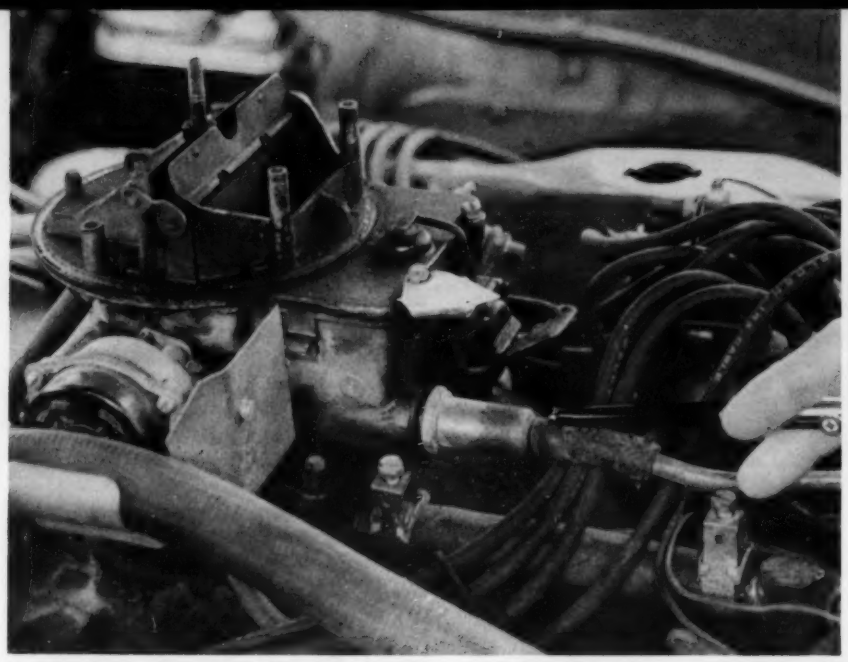
Pre-tuneup: Pop the battery filler caps off and check the water level. If it is below the fill line or doesn't cover the tops of the plates in all the cells, bring the level up with distilled water. Tap water is for emergencies only.

Next remove the ground cable (the cable that runs to the vehicle's frame or engine – usually negative). Then remove the other cable. Wash a dirty battery case with a baking soda solution and rinse with clean water. Clean corroded terminals with steel wool or a special cleaning tool. Trace the positive battery cable to make sure all electrical connections are tight, especially at the starter. Now reconnect the cables – the ground cable last.

Take off the air cleaner and move the throttle back and forth a couple times. If raw fuel doesn't shoot into the carburetor, check the fuel system out before attempting a tuneup. Start a cold engine and make sure the automatic choke opens fully from closed. If the choke doesn't work smoothly, clean the linkage. When cleaning and lubricating the linkage doesn't improve choke operation it may be time for a complete servicing (see the vehicle's manual). Before servicing it might be a good idea to test switch and heater components of electrical choke units.

Now's a good time to spray a can of combustion chamber cleaner down the carburetor throat. It wouldn't hurt to completely clean the outside of this fuel-air mixer either.

Because it is very hard to tell when the gasoline filter is dirty, go ahead and replace it. Be very careful when



In-line gasoline filters clamp into the fuel line or, as on this Ford product, clamp to one end of the fuel line with the other end of the filter screwing into the carburetor.

PCV valves are usually located in the rocker arm cover and should be replaced at every tuneup.

removing the gas filter to have a rag under the connection to catch leaking gasoline.

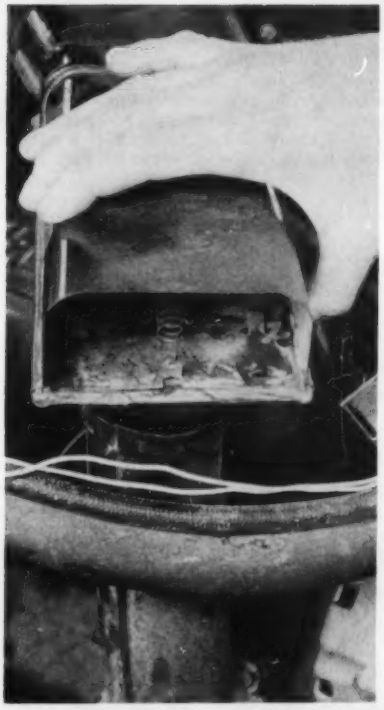
Hold the air filter element up toward sunlight or a bright light bulb. If you can't see light coming through all the way around the filter, replace it. When replacing the air cleaner, make sure all the vacuum lines are also reconnected tightly.

Emission controls: Moving to the emission control system, there are a couple of ways to check the positive crankcase ventilation (PCV) valve. The simplest is to put a sheet of paper over the oil filler neck. If the paper is pulled in by suction, the system is operating. Another way to check PCV valve operation is to remove the valve from its seat and press your finger over its open end. Engine speed should drop at least 40 rpm. Even if the PCV valve is functioning correctly, tuneup time is as good as any for replacing it. Also replace the PCV filter inside the air cleaner housing.

To check the exhaust gas recirculating (EGR) valve you'll need a hand vacuum pump. Disconnect the hose to the EGR, attach the hand pump and pump up four inches of mercury. The engine should begin missing. If it doesn't, it's service time.

At every other tuneup it is a good idea to replace the filter in the fuel

Almost hidden in the center of the picture is the heat riser. It should be doused regularly with solvent to keep it operating freely.



Thermostatically-controlled air cleaners need to be checked to ensure that the heat tube is properly connected at the air cleaner and manifold.

continued

Vacuum is a good measure of an engine's performance. A steady vacuum gauge reading at idle is one of the signs of a healthy engine that can be successfully tuned.

evaporation system canister.

With the engine cold and turned off, locate the heat riser on the exhaust pipe or crossover pipe near the exhaust manifold. If you can turn the valve, give both ends a shot of solvent. If not, tap it lightly until it is free, then lubricate it.

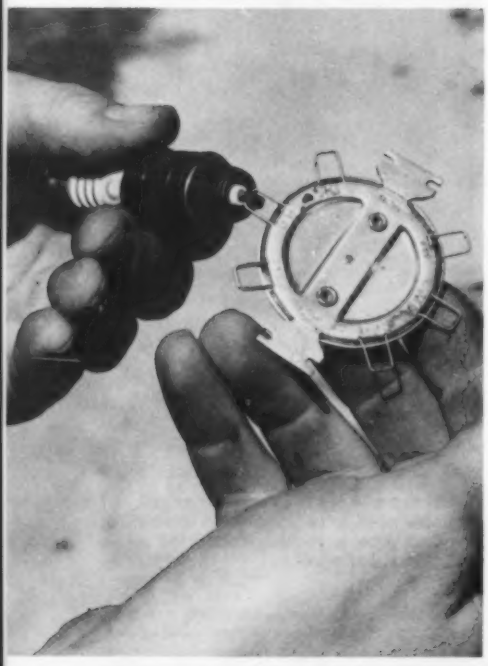
Most car manufacturers since 1971 have a special thermostatically controlled air cleaner instead of the heat riser. A few cars have both. Start the cold engine and make sure this valve closes over the snorkel. It should reopen in about a minute. If it doesn't, it needs repair.

Can it be tuned? Before the actual tuneup can begin, you must establish that the engine can be tuned. An engine that's malfunctioning isn't going to be improved much with a tuneup. To establish engine condition you'll need a compression gauge and a vacuum gauge. You might also invest in a remote starter switch so that you can crank the engine from under the hood.

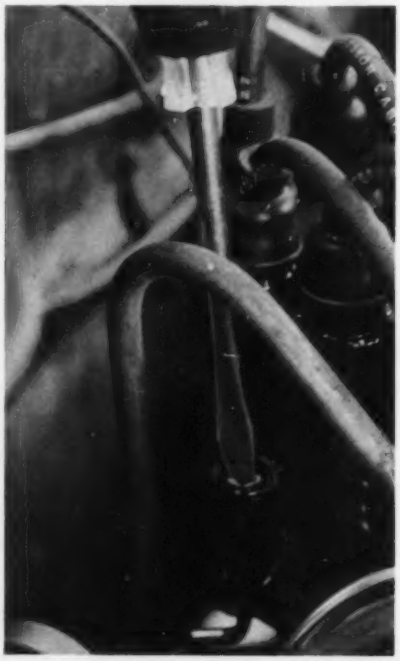
A sparkplug cable remover will allow you to reach cables in tight places such as below the exhaust manifold. Otherwise, grip the sparkplug cable boot with your hand, twist it back and forth until it pops loose, and then remove the cable. Be sure to mark each cable so that it can be reattached to the proper plug. One good way to do this is by wrapping marked tape around each cable. Another is to use marked clip-type clothespins.

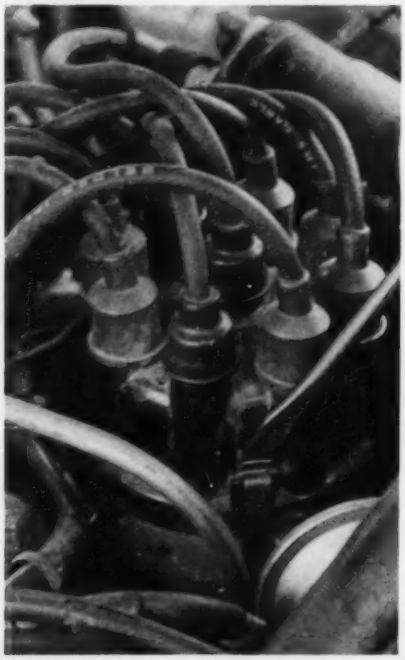
Check the wires to make sure they aren't cracked and don't have damaged insulation. If they are in poor condition, replace them. The best way to install new wires is to buy a replacement kit designed for your vehicle's engine. The only trick is in replacing the wires one at a time so that the correct plug is connected to the correct part of the distributor cap.

With the cables removed and marked, take a straw and blow the dirt out of the sparkplug ports. These particles could drop into the combustion chamber



Sparkplugs should be gapped to specifications with a special wire gauge.





(left) **GM-type** distributor caps can be removed by turning the screws in the cap until the lock releases. (right) **Non-GM** distributor caps are held in place by external clips that can be popped off with a screwdriver.

and cause serious internal damage. Carefully remove the plugs with a plug wrench or sparkplug socket and ratchet. Because the plugs may still be warm, leave them in the socket tool or handle them with a rag during inspection.

If the plugs have a crumbly chocolate-brown deposit, the engine is burning OK. But if the plugs are black and oily, either the plug is burning too cold or oil is leaking into the combustion chamber, fouling them. Oil fouling is common with older engines that have worn piston rings. In either case a hotter-burning plug should be used. On the other hand, a white powdery deposit means an engine is burning too hot and colder plugs are called for.

As you remove the plugs and examine them one at a time, you'll need to keep them in order. A cardboard box with holes punched into it and labeled to coincide with the plug's original position in the engine works well.

Push a compression gauge into the sparkplug depression and with the

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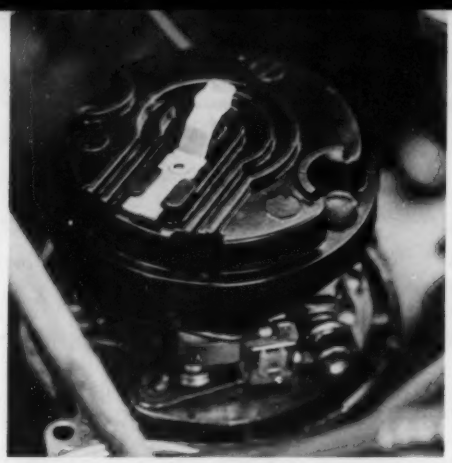


(left) **GM-type** rotor and distributor require slightly different service techniques than other distributors. (right) **Non-GM** distributor with rotor, points and condenser in place. Always note where the wires run from and connect to.

(left) **To adjust** the point gap, the rubbing block must be on a high lobe of the distributor cam. Some tuneup kits include a special ring that fits over the cam to hold the points open for gapping. (right) **With the points** held open by the cam, the gap can be adjusted to drag slightly on the specified feeler gauge. The adjustment slot is to the right of the feeler gauge and almost hidden by the wire from the condenser.

Light carbon deposits should be scraped off distributor cap contacts. If there is heavy carbon build-up or cracks in the cap, it should be replaced.

(left) **Dwell adjusting** access windows in the side of GM-type distributors allow points adjustments while the engine is running. If you don't have a dwell meter, turn the wrench to the right (clockwise) until the engine starts to miss or dies. Then turn it back ½-turn to get the correct point gap. (right) **Before testing,** set the meter to either tach or dwell as well as selecting six or eight cylinder. For four-cylinder engines, double eight-cylinder readings.

throttle and choke valves wide open, crank the engine at least four revolutions. Make a note of the highest reading. Do the same thing with all the cylinders. Compare the lowest and highest cylinder readings. If there is more than a 25 percent difference, you have a problem with the valves, pistons or cylinders. If two low readings are side-by-side, there's a good chance of a blown head gasket. In any case, the tuneup should be put off until the repairs have been completed.

A vacuum gauge will help find even more problems than the compression check. For complete details about the vacuum gauge and its use, see the January 1980 DRIVER. Basically, you connect the vacuum gauge to a primary vacuum source on a warmed-up engine. Note the reading as the engine idles. The reading should be between 17 and 22 inches of mercury. However, some newer 4- and 6-cylinder models deliver acceptable performance at 15 inches. A slight flicker can be expected with high performance engines. There is also a drop of one inch for every 1,000 feet above sea level.

The good news comes with a steady reading at idle, while the needle drops toward zero and jumps past 20 when the throttle is opened and closed. Any other reading is bad news. Translations of these other readings into specific problems usually come with the gauge's instructions or see the January 1980 DRIVER.

The tuneup plug: An engine with a fresh set of sparkplugs gives the best fuel economy and performance. Therefore, if it is tuneup time it is time for a new set of plugs. In the long run the new set may be cheaper than cleaning the old ones. Always make doubly sure you're getting the correct plug for your engine. It is not unusual for the same size engine to use different plugs depending on manufactured year or horsepower rating. If you're changing heat ranges be especially careful – ask the parts counter person for assistance.

Although most plugs are pregapped at the factory, double-check each one to be sure it's to specifications. Install the sparkplugs finger tight. If they don't have gaskets, give them $^{1}/_{16}$-turn with the sparkplug wrench. Those plugs with gaskets get a ¼-turn with the sparkplug wrench.

Getting to the point: After changing all the plugs you're ready to get into the distributor. Installing new ignition points and condenser are the only tricky parts of a tuneup – but even this job is simple if you work carefully. (If you have an electronic-ignition system you won't have these items to replace.)

Whether your car has electronic or conventional (nonelectronic) ignition, you'll still have to remove the distributor cap and wipe it clean. Again, identify each cable so that it can be replaced on its correct terminal. Check the cap very carefully for cracks or excessive carbon deposits on the inside contacts. If either is found, a new cap is called for. If the cap is in good condition, gently scrape any carbon off the contacts with a wire brush or screwdriver.

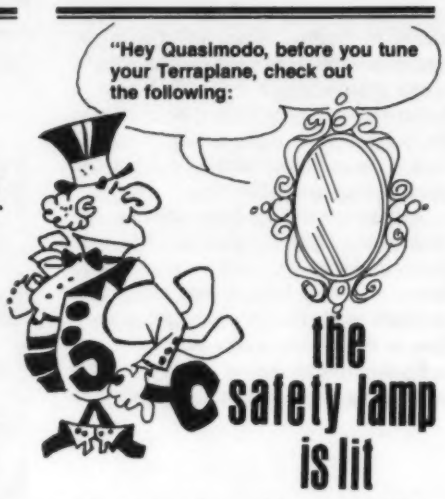
Now remove the rotor. Check it over. If it is cracked, chipped, burned or corroded, replace it. But make sure the new rotor matches the old one in size, shape and design.

dress right, DRESS

Dressing properly to work on your vehicle involves more of what NOT to wear than what to wear. When working on your car don't wear rings, watches, bracelets or any jewelry. Also don't wear neckties or loose clothing.

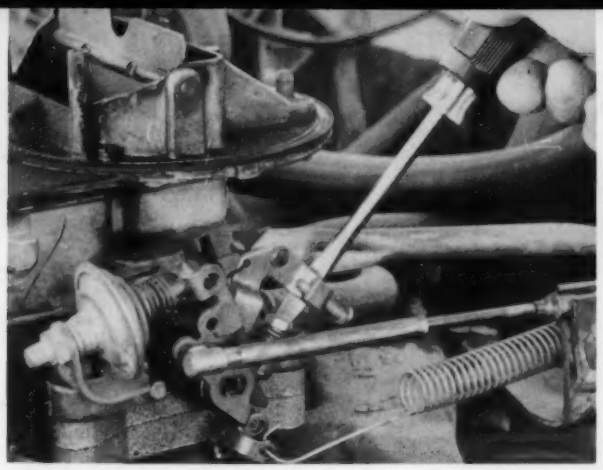
Wearing coveralls to protect your clothing and yourself from dirt and grease is a very good idea. Moreover, wearing safety glasses is a must.

And you women backyard mecahnics, tie up that long hair.



the safety lamp is lit

- Anytime you're working on a vehicle, read all the instructions available – the instructions in the manual on servicing the vehicle, the tool instructions, the instrument instructions, the first-aid instructions and the fire extinguisher instructions.
- Set the parking brake. Put the transmission in neutral or the automatic in park.
- If you're going to run the engine, make sure the area is well ventilated. If you can't ventilate the area, route the exhaust outside with a leak-proof hose. Carbon monoxide asphyxiation is to be avoided at all costs.
- Keep hands, hair and test leads well away from the fan, fan belt, power steering belt, air conditioner belt, and any other moving parts.
- Don't touch hot exhaust manifold, radiator, or high-voltage spark plug and coil terminals.
- Never look down a carburetor while the engine is being cranked or running. Sudden backfires not only ruin good mustaches, beards and hairdos, the burns are painful.



Hot idle speed is set at the solenoid or on the throttle linkage. Be sure to follow all the specifications and special procedures when setting the idle.

This vehicle has an approved Exhaust Emission Control System. Regular service is essential to minimize exhaust emissions. Consult service publications for service intervals and procedures.
IDLE SETTING
IGNITION TIMING

All cars made since 1971 have the vital specifications contained on an information plate in the engine compartment.

- Never use gasoline as a cleaning solvent.
- Keep a fire extinguisher rated for gasoline and electrical fires handy.
- Don't smoke or allow flame or spark to occur near carburetor, fuel line, fuel filter, fuel pump, spilled gasoline, cleaning solvents and other flammables. Be especially cautious of using anything electrical within 18 inches of the floor to avoid igniting gasoline vapors.
- Use the proper tool of the proper size for every job.
- Think about what might happen if your hand slips when working with a tight bolt or nut.
- Don't use worn tools.
- Don't cuss. Seriously, you may already have had one painful experience, but negative comments and thinking can distract you just enough to have another, more excruciating adventure!

At this stage if you have a conventional ignition, it's time to work on the breaker points. This is the time when you want to be especially careful not to drop any of the small hold-down screws. A magnetized screwdriver can be a big help.

On GM-type distributors, the points and condenser are held in place by set screws. Also notice that there are two wires that attach to the points. Generally the wires fit on a clip and can be pulled loose. However, some wires are held in place by a small nut—you'll need a small ignition wrench to loosen this nut. After removing the wire, carefully loosen the condenser and then the points by removing the hold-down screws. Now lift these parts off the plate.

Spray the plate with solvent and gently wipe it and the distributor cam clean. Apply a single drop of cam lubricant to one lobe of the cam. Avoid overlubricating.

Lock the new condenser on the plate with a screw in exactly the same place the old one was. Position the points on the plate with the guide hole over the guide post. Tighten down the screw and hook the wires back to the points. Since GM-type distributors are adjusted externally, put on the rotor and lock down the distributor cap.

The procedure for nearly all non-GM distributors differs when putting in the new points. Don't tighten the set screw all the way because adjustments have to be made. Tap the starter until the point rubbing block is on the peak of a cam lobe and the points are open. Insert a feeler gauge of the correct size (see your manual) between the points. Now adjust the gap until the gauge has a slight drag by moving a screwdriver blade in the special adjusting slots. Carefully tighten the set screw and double-check the gap.

Now connect the dwell meter according to its instructions and check for the correct reading. The manufacturer's dwell specification will be in degrees. On the GM-type distributors there is a small window in the cap. Slide this window up and turn the point-adjusting screw with a hex (Allen) wrench until you get the desired reading on the dwell meter. Don't forget to close the window tightly when you're done.

Carburetor adjustments: One of the most important checks for fuel economy is the carburetor. Precise adjustment is necessary to get the best possible mileage from your vehicle. If your vehicle has fuel injection, don't tamper with it—it is best left to the experts. In almost the same self-service category as fuel injection are the carburetors on vehicles manufactured in 1975 and later. Strict exhaust-emission standards have made the carburetor one of the most complicated systems of an engine. It often requires expensive equipment such as an infrared exhaust analyzer, combustion analyzer and artificial enrichment with propane gas. Again, this is a job for the pros.

The pre-1975 models aren't so difficult. Warm the engine up, remove the air cleaner and connect a tachometer. Set the vehicle up according to the conditions outlined in the service manual or on the vehicle emissions-control label. These conditions vary from manufacturer to manufacturer and can be very exotic. For example, some require the transmission to be in neutral, others in gear; some want the air conditioner on, others off; and still others specify lights on or off.

Check the tachometer to see if the idle rpm is according to the specifications. If not, locate the idle set screw at the throttle linkage or anti-dieseling solenoid and adjust it until the idle is at the right speed.

On pre-1971 engines you can also set the idle mixture as well as the idle

continued

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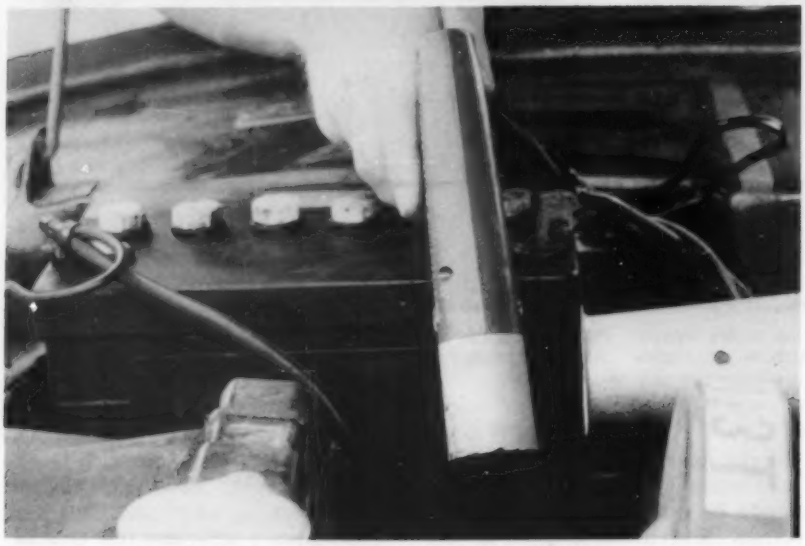

With the engine idling, aim the timing light at the marks, keeping it at about a 45-degree angle. Not aiming the light carefully is a major cause of timing error.

speed. Locate the mixture screw(s) one on single barrel carbs, two mixture screws on two-and four-barrel carbs. Turn the screw in until the idle roughens, then turn the screw out slowly until the highest possible tach reading is obtained. If there are two idle screws, repeat the procedure on the second screw. You may need to turn the idle speed down before adjusting the second screw since the engine may race when the first mixture is reset.

Never try to smooth out the idle by turning the speed up—a higher idle just wastes gasoline and contributes to dieseling. Finally, double check the idle speed with the air cleaner in place.

It's all in the timing: After setting the idle you're ready to make the final and most important adjustment—the ignition timing. With the tachometer and ignition timing light connected, locate the timing mark—you may have to clean the grease and grime off first. The mark is usually on the lower front pulley or on the vibration damper below the fan. Now carefully make a neat line with white chalk, white enamel paint or fingernail polish over the correct timing mark (given in your manual). This will help you see the mark while the engine is running.

Check the manual for information sticker to see if there are any special procedures for timing such as disconnecting the distributor vacuum advance line.

With the engine warm and idling at the correct speed, aim the light carefully at the timing marks. Not aiming the light properly is one of the primary causes of timing error—so be sure to keep the light at about a 45-degree angle and sight directly down the light.

The mark and timing pointer will align on each flash of the timing light if the timing is correct. If they don't line up, you will have to adjust the timing by rotating the distributor. To do this, you must loosen the clamp bolt that holds the distributor. Then slowly rotate the distributor until the timing mark and pointer align. Carefully lock down the clamp bolt and double check the setting.

The proof is in the MPG. Now recheck everything. Then after cleaning up your work area, buckle yourself into the vehicle and take a slow test drive. If everything seems to respond well, take the vehicle for a short highway drive. OK, you're all set. If you kept track of your miles per gallon before the tuneup, and you followed the tips from "Protecting Your Petrol Piggy Bank" earlier in this issue of DRIVER, you'll probably have a pleasant surprise the next time you compute mpg. It may even become More Pleasure Per Gallon.

BACKFIRE
LETTERS to the EDITOR

TRIPPING THE SIGNALS

Regarding the letters concerning the difficulty of tripping traffic-operated signals with a motorcycle (Aug and Nov '79) this is an even greater problem for a bicyclist. One safe way around the problem is to play pedestrian and operate the appropriate push buttons provided on most such signals. In many areas bicyclists are encouraged to use this method, especially to make left turns, even at ordinary signals on wide streets. I can't say how the police would react to a motorcyclist doing this, but at least you would not be opposing traffic moving with the green light.

Why cyclists should ride with traffic—Amen! A pedestrian can sidestep over a curb or leap over a guardrail to avoid a head-on collision. A wheeled vehicle cannot do that! All cyclists should have a rear-view mirror which a pedestrian doesn't normally carry. Pedestrian-operated wheeled vehicles such as baby buggies, wheelchairs, handcarts, and wagons which could be trapped between a car and a curb should be reflectorized.

SKC Dennis J. Hopper, USN
NROTC Unit, VMI
Lexington, VA 24450

"WOW! I COULD'VE HAD A V-8!"

I find the DRIVER Magazine a very useful tool in conducting the Safety Program at Niagara. Many of the articles are pertinent and timely for existing conditions at Niagara.

Reading through the January '80 issue, I read your editorial and thought I would take the time to set the record straight. In your fourth paragraph you stated, "the love affair with the V-8 began in 1932 when Ford introduced its famous flathead." Famous indeed it was, but the love affair began long before when in 1914 Cadillac introduced its V-8 for its 1915 model.

V-type engines were really nothing new but Cadillac was the first in developing methods where it was both

feasible and financially profitable to do this on a production vehicle. At this time Cadillac was not so much considered a luxury car, but a quality car. In 1926 Cadillac also introduced the LaSalle as a companion car to the Cadillac which was equipped with a slightly smaller V-8 engine than the Cadillac.

In 1929 Cadillac was to introduce a full line of V-type engines on all Cadillac cars for the 1930 model year, which were the V-8, V-12 and the V-16 with the LaSalle continuing with the V-8. Both the V-12 and V-16 were overhead valve engines. The V-12 was to continue in production through the 1937 model year and the V-16 going through a radical change in 1938 and finally being phased out in 1940. LaSalle also was discontinued after 1940.

What Ford accomplished was introducing a cast block V-8 in the low price field. Before this all V-type engines had separate castings for crankcase, cylinders and heads. Many cars had V-type engines long before Ford introduced a low price V-8. Some of these cars were: Lincoln (V-8), Marmon (V-16), Peerless (V-8), Pontiac (V-8), Packard Twin Six (V-12) and Chevrolet in 1918 (V-8), and of course Cadillac.

Mr. Robert A. Morris
914th TAG/SEG
Niagara Falls IAP
Niagara Falls, NY 14304

As you can see from the length of your letter in print, you had much more room to explain "love affair" from your point of view than we did in January's "Double Clutch." For DRIVER, or any magazine for that matter, each word has to be carefully balanced against the overall tenor of the story. As far as that article went, "The American's *love affair with the* affordable *V-8 began . . ." Nitpicking aside, Bob, how much cash did you get when you turned your Cord over for scrap during the WW II aluminum drive?*

TOWING AND AIR

In 1972 when I went overseas and stored my VW camper, your magazine was most helpful in supplying me with information on how to prepare it for the two years of storage as well as what to do upon my return. As I am in need of good advice again, I thought I would write you.

I am planning to drive my 1977 Volare station wagon, V-8, automatic, to Dallas when I detach from my present duty station. I want to pull my 1978 Honda Civic CVCC, four-speed, standard transmission, AC, behind my Volare. The manual on the Honda says not to tow it more than 50 miles at 55 mph. The dealer says I can if I fill the transmission with an extra quart of engine oil which will lube the bearing during the time I am pulling it. What would you recommend? Also, is it all right to use synthetic oil in the transmission?

One other question. I recently purchased radial tires and I would appreciate knowing what air pressure I should carry—I am presently carrying 28 pounds in all four tires.

Rodney C. Wallace, USN
327 Bogue Circle
China Lake, CA 93555

While the service manager should know more about your vehicle than we do, we'd suggest a different solution. Why not check into removing the axles so that the transmission doesn't turn at all. Use a synthetic oil in the transmission only if you're already using a synthetic transmission lubricant. While synthetics are mixable, stay away from doing so if at all possible. As for air pressure in your radial tires, that should be spelled out in your owner's manual. Lost or never had the manual? Here we go full circle–ask the man who should know your vehicle best–the service manager.

PICTURES WANTED

Aren't you going too far with the "No Miss DRIVER" edict? I can sort of understand the Department of Defense stand that women should not be held up as sex objects, but the way DRIVER Magazine has displayed women during the past few months is an all-time low.

If I were to have to say what kind of women were in the Department of Defense, associated with members of the Department of Defense and/or involved in motoring and traffic safety based on what I've seen in DRIVER, I think you'd find the statement more of a put-down to women than Miss DRIVER could ever have been.

On second thought, I will say what DRIVER has shown me about women and their relation to traffic safety:

The women associated with motor vehicles and traffic safety range from young, almost pre-adolescents who think it's fun to play on mopeds and get your picture taken, to mothers who either hide behind helmets inside racing cars or are only seen dressed in the heaviest winter clothing at ice races.

Meanwhile the men you show are almost always young, handsome, macho types; although some of them seem to be a bit kinky—dressing in leather and the like.

Come on. That's hardly the real world. If you are going to picture a physically well-built, good-looking guy in leather, the 50-50 balance of men to women says there should be an equally attractive woman out there, also. But, to date, not on the pages of DRIVER.

Please do not print my name or address—I've got enough problems with cranks.

Name withheld

So have we.

Address your letters to:

Editor ■ DRIVER Magazine ■ HQ AFISC/SEDD ■ Norton AFB CA ■ 92409

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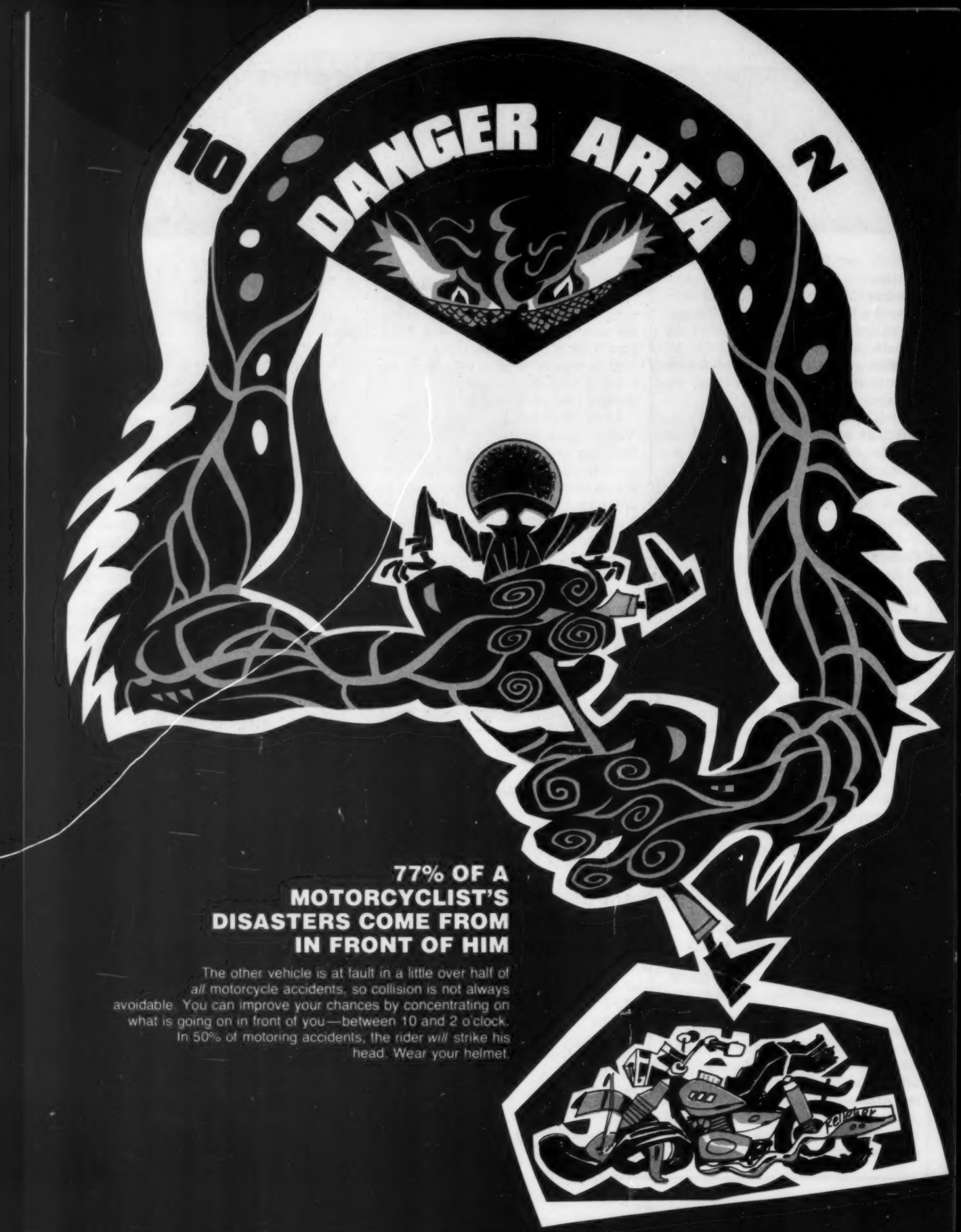

77% OF A MOTORCYCLIST'S DISASTERS COME FROM IN FRONT OF HIM

The other vehicle is at fault in a little over half of *all* motorcycle accidents, so collision is not always avoidable. You can improve your chances by concentrating on what is going on in front of you—between 10 and 2 o'clock. In 50% of motoring accidents, the rider *will* strike his head. Wear your helmet.